University of Texas Bulletin

No. 2232: August 22, 1922

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BY
E. H. SELLARDS

Bureau of Economic Geology and Technology
Division of Economic Geology
J. A. Udden, Director of the Bureau and Head of the Division

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The benefits of education and of useful knowledge, generally diffused through a community, are essential to the preservation of a free government.

Sam Houston.

Cultivated mind is the guardian genius of democracy. . . It is the only dictator that freemen acknowledge and the only security that freemen desire.

Mirabeau B. Lamar.

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WELL RECORDS IN PANOLA COUNTY, INCLUDING STRUCTURAL CONTOUR MAP

By E. H. Sellards

Panola County, which borders Louisiana, lies within the Tertiary belt of northeast Texas. With the exception of river terrace deposits and probably isolated remnants of the Mt. Selman, the Wilcox formation lies at the surface throughout the entire county. The Wilcox formation consists prevailingly of shallow water deposits, including clays, cross bedded sands, sand lenses and seams of lignite. Accordingly it is as a rule difficult to follow dips in this formation or to make out structural features from surface exposures. The lignite beds may be discontinuous, while the sands are lenticular and variable. It becomes desirable, therefore, to obtain information as to structural conditions, in so far as possible, in the county from well records. A considerable amount of drilling has been done in this county, and in this report well logs are utilized in a study of the structural conditions.

Regional Structural Features: Panola County is located on the west margin of a structurally high area known as the Sabine Uplift. This uplifted area, which is about 80 miles long by 60 miles wide, lies chiefly in Lousiana, but extends to the west and southwest into the adjoining counties of Texas.

In Panola County the regional dip in the underlying formations is found to be to the southwest or away from this uplift. The amount of dip from the northeast to the southwest through the central part of the county as measured on one of the Upper Cretaceous formations was found in one instance to average 17.7 feet per mile. This measurement was obtained from the position of the base of the Annona formation in the Steele and Lawrence wells, or through a distance of about 25 miles in which distance the Annona was found to descend 444 feet. If the measurement had been taken to the west or west-southwest, the rate of dip, as will be subsequently shown, would have been greater per mile.

Structural Features Within the County: An inspection of the contour map, which has been prepared from the data af-

forded by the wells here listed, indicates that there is a pronounced structurally high area extending through the central part of this county in a northeast-southwest direction. At the northwest side of this "high" the formations drop rapidly to a lower level. On the opposite or southeast side the drop is not well determined, but apparently is more moderate. To the southwest approximately in line with the axis of the structural feature the drop in level in the formations is moderate, affording the measurement already given as 17.7 feet per mile between the two wells used or probably an average of between 15 and 20 feet per mile. The rapid drop of the formations to the northwest may be brought about either by faulting or by folding. This, however, can be determined only by additional records. If by faulting the trend of the fault is northeast-southwest with downthrow on the northwest.

Succession of Formations: The formation at the surface in Panola County, as already noted, is the Wilcox, which is of Eocene age. The wells of this county, starting in the Wilcox, pass through the next underlying formation, the Midway, and reach into the Cretaceous. Next beneath the Midway is the Arkadelphia clay, the latest of the Cretaceous formations. Owing to lack of very pronounced contrasts in lithology, the dividing line between the Midway and Arkadelphia is difficult to determine from well logs, the formations above and below the contact being logged chiefly as shale and gumbo, with some sand and sandy shale and occasional "boulders." The Wilcox-Midway contact is likewise indefinite in most of the logs. It is probable that in the northeastern part of the county the Wilcox is thin, gradually thickening with the dip of the formations to the southwest. The succession of formations to be expected in the county is as follows:

Tertiary—Eocene

Wilcox.	Sand, shale and lignite beds.
Midway.	Chiefly shales.

Upper Cretaceous

Arkadelphia.	Chiefly shales and gumbo.
Nacatosh.	Sands and sandy shales.

Marlbrook.	Shale, gumbo and chalk.
Annona.	Chiefly chalk.
Brownstown.	Chiefly shales.
Blossom.	Sand and sandy shales.
Eagleford.	Shales and gumbo.
Woodbine.	Sand and shells.

Lower Cretaceous Formations

Chiefly limestones.

The fact that certain of the deep wells in extreme northeast Panola County and in adjacent parts of Louisiana pass through the Upper Cretaceous and into the Lower Cretaceous has been observed by Powers,[1] and has been further demonstrated by Hammill, who has interpreted the log of the Augurs No. 1 well, located in Louisiana near the northeast corner of Panola County, as follows:[2]

	Depth in Feet.		Thickness.
	From.	To.	
Tertiary—Eocene:			
Wilcox	0	160	160
Midway	160	467	307
Upper Cretaceous—Gulf Series:			
Arkadelphia clay	467	1,081	601
Nacatosh sand	1,081	1,215	134
Marlbrook marl	1,215	1,362	157
Annona chalk	1,362	1,824	462
Brownstown marl	1,824	1,920	96
Bingen formation (Eagleford-Woodbine)	1,920	2,400	580
Lower Cretaceous—Comanche Series:			
Washita group	2,400	3,067	667
Fredericksburg group	3,067	3,440	373
Trinity group	3,440	3,752	312

Formations Used in Structural Study: In using the wells of Panola County in structural studies it will be found that the horizon most widely recognizable is the base of the Annona formation. The top of this formation is often indefinite, grading into the shales and chalk of the Marlbrook formation; the base, however, shows an abrupt change from chalk to gumbo or shale. The Nacatosh sands are easily recognized in the north-

[1]The Sabine Uplift, Bul. Am. Ass'n. Pet. Geol. V. 4, No. 2, pp. 117-136, 1920.

[2]Bull. Am. Ass'n. Pet. Geol. V. 5, No. 2, pp. 299-301, 1921. In the publication referred to the log of the well is given in full, as well as the logs of the Jeter and Jerigen Wells in Panola County.

eastern part of the county, but are found to become thinner to the southwest and to be wanting in some wells. The top of the Lower Cretaceous limestones is a fairly definite marker in such wells as reach to that depth.

Variations in the Section: The well logs indicate that an appreciable variation occurs in the section in Panola County when followed from northeast to southwest. This variation shows itself more particularly in a reduction in the amount of sand, most pronounced at the Nacatosh horizon and in an increase in the amount of chalk rock. The thinning and disappearance of the Nacatosh to the southwest indicates evidently increased remoteness from the source of supply in that direction.

In wells drilled in the northeastern part of the county the Nacatosh sand is found to have a thickness of from a few feet to 150 feet or more. At Carthage, in the central part of the county, these sands are thin, some of the logs recording no sand at all at this level. Likewise in the western and southwestern parts of the county, these sands, so far as records show, are thin or wanting. The interval of the Nacatosh sand, when that formation is wanting, is occupied by shale or chalk strata.

The formations next below the Annona including the equivalents of the Brownstown, Eagleford and Woodbine are scarcely separable one from the other. In Panola County this group of formations has a total thickness of between 500 and 600 feet. The Blossom sand and sands of the Woodbine should occur within this interval. In Louisiana the Woodbine and Eagleford combined are known as the Bingen formation.

The Lower Cretaceous limestones are entered in this county at a depth of 2,200 to 2,600 feet from the surface, depending upon the surface elevation and the location of the well within the county.

Producing Horizons and Fields: The Bethany gas field is located in the extreme northeast corner of Panola County, extending into Louisiana.

Production in the Bethany field is obtained from at least four horizons. The first of these, nearest to the surface, is the Nacatosh sand, which in the structurally highest part of the field lies at a depth of 1,050 feet or less. This horizon pro-

duces gas chiefly. The next producing horizon is the Blossom sand, which is recorded at between 1,900 and 2,000 feet from the surface. Some small oil wells have been obtained at a depth approximating 2,400 feet, probably near the top of the Lower Cretaceous. Some large gas wells have been obtained in this field at between 2,900 and 3,000 feet, representing a horizon some 500 feet below the top of the Lower Cretaceous. According to Hull and Spooner six wells in 1922 were producing gas from this sand.[1]

Literature and Maps: The literature on the Sabine Uplift includes Bulletins of the United States Geological Survey and of the Louisiana Geological Survey, as well as papers in various current magazines. The uplift was first described by Harris in Bulletin 7 of the Louisiana Geological Survey, 1907, and again in Bulletin 429 of the United States Geological Survey, 1910. Papers on the Sabine Uplift and on the Associated Oil and Gas fields will be found in the Bulletins of the American Association of Petroleum Geologists.

A map showing the surface geology of this and other counties of East Texas by Alexander Deussen accompanies Water Supply Paper 335 of the United States Geological Survey. Bulletin 1869 of the Bureau of Economic Geology and Technology of the University of Texas, Geology of East Texas, with accompanying map, includes the southern part of this county.

Contour Map and Sections

The contour lines on the accompanying map are based on sea level datum and are drawn at 50 feet intervals. Necessarily the contouring is generalized, but is probably sufficiently detailed to indicate the principal structural features.

In figure I there is shown a section through the county from northeast to southwest. The location of the wells used in making this section is indicated in the drawing. The logs of most of the wells are given.

Well Records

The wells in this county, the records of which have been used in making the contour map and section, are listed in the table

[1]Bull. Am. Ass'n. Pet. Geologists, V. 6, No. 3, pp. 179-192, 1922.

of well records which follows. The column headed "Map entry" records the actual position of the base of the Annona formation below sea level. This entry also appears on the maps and serves to locate the wells.

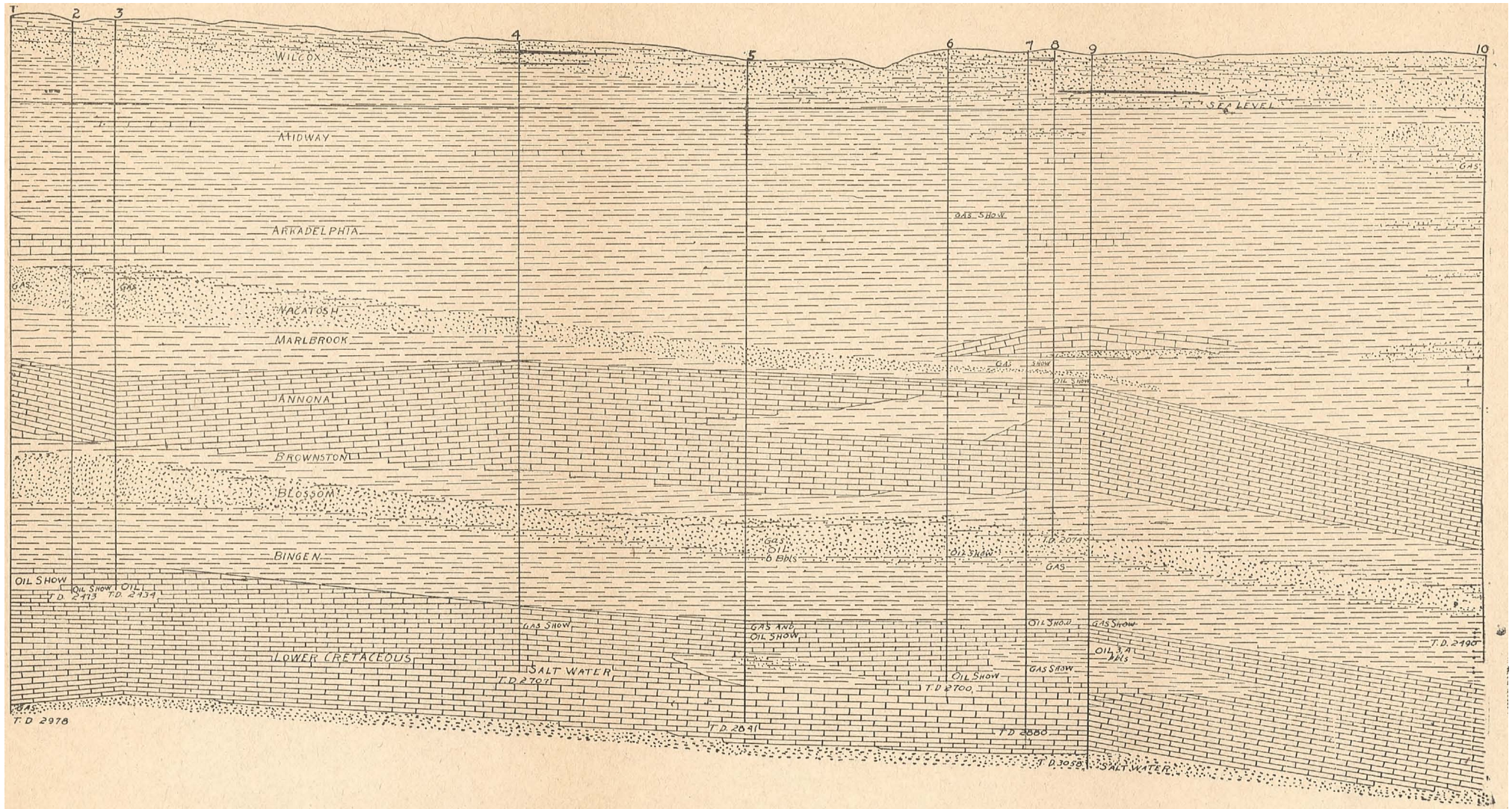

Fig. 1. Geologic section extending in northeast-southwest direction through Panola County. Scale: Horizontal, 1 inch equals 3 miles; vertical, 1 inch equals 600 feet.

The wells, locations of which are indicated in the sketch, are as follows: 1. Augurs 2; 2. Trosper 1, of Gulf Prod. Co.; 3. Trosper 1, of Palmetto Oil Co.; 4. Guill 1; 5. Waterman; 6. Pierce 1; 7. Poole 1; 8. Adams 1; 9. Cooke 1; 10. Nail 1.

Well No. 1 is located near the northeast corner of the county, wells 7 and 8 are in or near the City of Carthage in the central part of the county, while well No. 10 is located about 9 miles northwest of Carthage. From the section it may be seen that the Nacatosh sand, which is well developed in the northeastern part of the county, is thin or wanting in the central and western parts of the county.

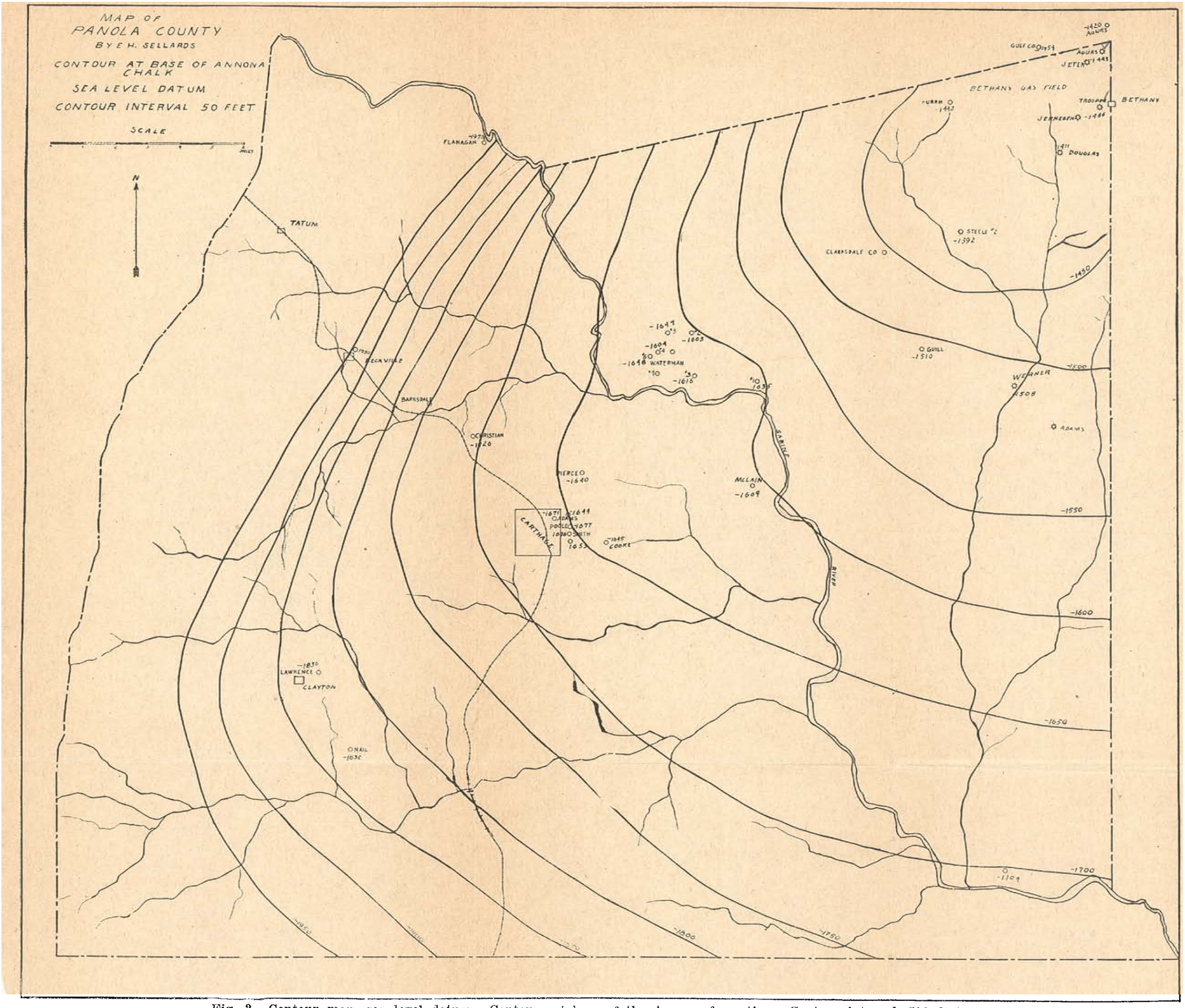

Fig. 2. Contour map, sea level datum. Contours at base of the Annona formation. Contour interval, 500 feet.

Name of Well.	Location.	Elevation.	Depth.	Base of Annona.	Map Entry.	Remarks.
Adams 1. Carthage Oil Company	Near city limits of Carthage	253	2,074	2,079	1,671	Show of oil.
Adams 1. The Texas Company	N. E. part of city	349.6	2,774	1,816	----------	Nacatosh 1,078-1,228.
A. Adams 2. The Texas Company	J Mathews Surv.	----------	2,063	1,670	----------	
T. C. Adams B-2. The Texas Company	Isom Hatcher	----------	2,749	----------	----------	27 M. cu. ft. gas.
Agurs 1. Gulf Prod. Company	Near Agurs 2	352.3	1,080	----------	----------	17 M. gas; 395 lbs. from Nacatosh.
Agurs 2. Gulf Prod. Company	494' S. and 853' W. of the 27 mi. post	352.7	2,988	1,795	1,443	Gas at 1,060 and 2,988.
Agurs 3. Gulf Prod. Company	J. Shandon Surv.	----------	2,951	1,813	----------	5 M. cu. ft.; 1,010 lbs.
Barksdale 1. Panola County Oil Company	Near Beckville	----------	2,559	1,984	----------	Nacatosh not recognized.
G. W. Brumble 1. The Texas Company	E. F. Mitherson	----------	1,966	1,717	----------	9 M. at 1,960-1,966; 880 lbs.
H. L. Brumble 1. The Texas Company	E. F. Mitherson	----------	1,914	1,681	----------	16 M.; 880 lbs.
Christian 1. Humble O. & R. Company	Duncan Surv.	312±	2,575	2,038	1,726	Nacatosh not recognized.
Cooke 1. Excelsior Oil Company	1¾ mi. E. N. E. Carthage	235	2,340	1,880	1,645	Nacatosh 1,260?-1,285?
T. Douglas 1. Gulf Prod. Company	Lacy Surv. 3 mi. N. 1½ from E. county line	2,881	2,403	1,700	1,411	Nacatosh 985-1,102; 5 M. gas at 985; 11 bbls. at oil 2,403.
Edens 1	¼ mi. N. E. of Beckville	34±	3,287	2,296	1,950	Nacatosh not recognized.
Flanagan 1. Panola Pet. Co.	12 mi. N. 2 mi. W. of Carthage	225±	2,862	2,175	1,950±	Nacatosh not recognized.
Furrh 1. Producers Oil Company	About 1 mi. from N. and 5 mi. from E. county line	350.8	3,339	1,792	1,442	Abandoned.
Guill 1	6 mi. E. and 9 mi. from N. county line	315	2,707	1,825	1,510	Salt water at 2,707.
Jernigan 1	W. H. Lacy Surv. N. E. part of county	----------	2,363	1,730	----------	Nacatosh sand 1,060-1,078. Oil show at 2,347-2,363.
Jernigan 2	W. H. Lacy Surv.	----------	1,063	----------	----------	8 M. cu. ft. gas; 370 lbs.
A. Jeter 1. Gulf Prod. Company	⅔ mi. from N. 1⅓ mi. from E. county line, John Womack Surv.	----------	2,925	1,785	----------	95 M. gas; 1,150 lbs.; salt water.
Lawrence 1. Transcontinental Company	About 8 mi. S. W. of Carthage	354	2,707	2,400	1,836	Nacatosh not recognized.
McLain 1. Commercial Drilling Co.	5 mi. E. 1½ mi. N. of Carthage	197	2,894	1,805	1,609	Nacatosh not recognized.
Nail 1. Nat'l Oil Company	3 mi. S. E. of Clayton	268	2,489	2,100	1,832	Nacatosh not recognized.
Pierce 1. Hog Bayou Oil Co.	G. Robert Surv.	261	2,701	1,901	1,640	Nacatosh not recognized.
Poole 1. Carthage Oil Company	N. E. city limits	295.1	2,180	1,948	1,653	Nacatosh not recognized.

Well Records in Panola County—Continued.

Name of Well.	Location.	Elevation.	Depth.	Base of Annona.	Map Entry.	Remarks.
Poole 1. Commercial Oil Company	Geo. Goodwin Surv. 1 mi. N. E. of Carthage	235	2,880	1,912	1,677	Nacatosh 1,360± Oil show about 2,400.
Poole 1. Hog Bayou Oil Company	1 mi. N. E. of Carthage	260±	2,111	1,904	1,644	Nacatosh 1,348? Show of oil about 2,073.
Poole 1. Smith et al.	1 mi. N. E. of Carthage	282.6	2,157	1,918	1,636	Nacatosh sand 1,356± Some oil about 2,110.
Steele 2. Magnolia Pet. Company	B. C. Jordan Surv.	287.8	1,926	1,680	1,392	Nacatosh at 1,008-1,068; 20 M. gas at 1,926.
Trosper 1. Gulf Prod. Co.	Welligan Surv. near E. county line 2 mi. from N. county line	350±	2,473	1,816	1,466	Show oil at 2,462-2,463.
Trosper 1. Palmetto Oil Company	N. E. part of county. Jas. Thorp Surv. 2 mi. from N. county line	----------	2,434	1,801	----------	Nacatosh 1,040-1,201. Small pumper at 2,434.
Waterman 1. The Texas Company	Thos. A. Pratt Surv. 5 mi. N. 3 mi. E. of Carthage	203.9	2,703	1,839	1,635	Nacatosh not recognized.
Waterman 2. The Texas Company	J. W. Jones Surv. 5½ mi. N. 4½ mi. E. Carthage	205.4	3,131	1,808	1,603	Nacatosh not recorded. Salt water. Abandoned.
Waterman 3. The Texas Company	J. M. Jones Surv. 5 mi. N. 5 mi. E. of Carthage	204.1	2,605	1,820	1,616	Nacatosh not recorded. Salt water at 2,056.
Waterman 4. The Texas Company	J. N. Chears Surv. 6 mi. N. 3 mi. E. of Carthage	201.4	2,025	1,805	1,601	Nacatosh 1,210-1,215.
Waterman 5. The Texas Company	T. A. Pratt Surv. 6 mi. N. 3 mi. E. of Carthage	201.2	2,100	1,849	1,647	Nacatosh not recognized.
Waterman 6. The Texas Company	T. A. Pratt Surv. 5½ mi. N. 3 E. of Carthage	205.2	2,841	1,853	1,648	Nacatosh 1,221-1,251.
Waterman 7. The Texas Company	T. A. Pratt Surv. J. F. Chealrs	----------	2,600	1,838	----------	Nacatosh 1,287.
Waterman 8. The Texas Company	A. L. Birdsong	----------	2,080	1,833	----------	
Werner B-1	3 mi. from E. county line and about 10 mi. N. county line. S. Pierce Surv.	272	3,000	1,780	1,508	Nacatosh 1,080-1,145. Oil show 2,375. Salt water at 3,065.
Werner B-2. Gulf Prod. Company	Wm. A. Pope	----------	3,000	1,940	----------	Salt water at 2,935.
Werner B-3. Gulf Prod. Company	T. C. Ry. Co. No. 13	----------	3,005	1,880	----------	Oil show at 2,540-2,550. Salt water at 2,998-3,005.
E. L. Werner 1. Gulf Prod. Company	3 mi. from E. and 3 mi. from S. county line	204.1	2,935	1,908	1,704	Gas and salt water at 2,935.
E. L. Werner 2. Gulf Prod. Company	E. Daniels near Sabine River	----------	2,904	1,878	----------	1½ M. gas. Abandoned.

Well Logs

The well logs which follow will serve to illustrate the character of the formations and the drilling conditions in various parts of the country. Drilling in this county has been chiefly by rotary.

Log of the Adams No. 1, Carthage Oil Co., Panola County. Location Geo. Goodwin Survey, Within or Near City Limits of Carthage About Three-fourths of a Mile from Court House. Elevation 253 ft. Drilled 1921. Map Entry 1671.

	Depth in Feet.		Thickness.
	From.	To.	
Sand and clay	0	70	70
Sand and gumbo	70	106	36
Rock	106	109	3
Gumbo and sand	109	179	70
Shale	179	226	47
Rock	226	229	3
Sand	229	240	11
Gumbo, set 12″	240	244	4
Gumbo	244	247	3
Sandy shade	247	252	5
Shale	252	267	15
Hard rock	267	269	2
Shale and boulders	269	378	109
Rock	378	382	4
Shale and gumbo	382	401	19
Shale and boulders	401	428	27
Hard rock	428	430	2
Shale and boulders	430	477	47
Rock	477	481	4
Shale and boulders	481	500	19
Gumbo	500	570	70
Shale and boulders	570	655	85
Gumbo	655	680	25
Gummy shale	680	747	67
Shale and boulders	747	787	40
Gumbo	787	822	35
Shale and boulders	822	882	60
Gumbo	882	902	20
Shale and boulders	902	973	71
Gumbo	973	1,025	52
Shale and boulders	1,025	1,075	50
Gumbo	1,075	1,100	25
Hard chalk rock	1,100	1,115	15
Chalk rock	1,115	1,145	30
Hard chalk rock	1,145	1,155	10
Gumbo	1,155	1,165	10
Shale and boulders	1,165	1,195	30
Gumbo	1,195	1,220	25
Hard shale	1,220	1,255	35
Chalk rock and shale	1,255	1,280	25
Soft chalk	1,280	1,300	20
Hard chalk	1,300	1,378	78
Pack sand	1,378	1,380	2
Hard chalk and sand	1,380	1,395	15
Chalk rock	1,395	1,420	25
Hard rock	1,420	1,424	4
Hard chalk	1,424	1,450	26
Broken chalk	1,450	1,535	85
Shale	1,535	1,585	50
Gumbo	1,585	1,595	10
Chalk rock	1,595	1,630	35

Log of the Adams No. 1, Carthage Oil Co., Panola County. Location Geo. Goodwin Survey, Within or Near the City Limits of Carthage About Three-fourths of a Mile from Court House. Elevation 253 ft. Drilled 1921. Map Entry 1671.—Continued.

	Depth in Feet.		Thickness.
	From.	To.	
Hard chalk	1,630	1,654	24
Gumbo	1,654	1,656	2
Hard chalk	1, 56	1,742	86
Hard lime rock	1,742	1,745	3
Chalk rock	1,745	1,768	23
Hard chalk	1,768	1,800	32
Lime rock	1,800	1,824	24
Chalk	1,824	1,834	10
Hard lime	1,834	1,870	36
Chalk	1,870	1,889	19
Soft chalk	1,889	1,890	1
Hard lime	1,890	1,895	5
Hard chalk	1,895	1,905	10
Hard chalk	1,905	1,924	19
Sandy shale	1,924	1,934	10
Sandy shale, boulders and streaks of lime rocks	1,954	2,017	83
Similar streaks sand, shale, and lime shells	2,017	2,070	53
Gummy shale	2,070	2,074	4
Sandy shale	2,074	2,079	5
Correlation.			
Nacatosh	1,378?	1,389?	2
Marlbrooks	1,380?	1,535	145
Annona	1,595	1,924	329
Brownstown	1,924	?	
Blossom Sand (but little developed)			

No less than eight wells have been drilled in and near Carthage, three of which are in the Pool lease. In four of these, more or less sands have been reported at about the expected place of the Nacatosh sand. In one of them, the Pool well, of the H. J. Bayer Oil Company, the interval from 1348 1400 is recorded as chiefly sand with some shale breaks. In two of the wells no sands are recorded at the Nacatosh interval, their place being taken by chalk and shale.

In these wells some thin sands are usually found at between 100 and 200 feet below the base of the Annona. These sands, which are probably within the Blossom member, have afforded a small amount of high grade oil in the Pool and some other wells.

Log of W. C. Agurs No. 2, Gulf Production Company, Jacob Womack Headright, 494′ S. and 853′ W. of the 27 Mile Post. Completed Jan., 1919. Initial Production Reported at 18 M. Cu. Ft. Gas. 1150 lbs. Rock Pressure. Some Salt Water. Map Entry 1443. Elevation 352.7.

	Depth in Feet.		Thickness.
	From	To.	
Surface clay	0	22	22
Sand	22	24	2
Clay	24	30	6
Clay and sand	30	75	45
Gravel	75	85	10
Packed sand	85	126	41
Rock	126	127	1
Shale	127	233	106
Gumbo	233	241	8
Rock	241	242	1
Shale	242	258	16
Gumbo	258	329	71
Rock	329	331	2
Gummy shale and boulders	331	569	238
Rock	569	571	2
Gumbo and boulders	571	684	113
Gummy shale	684	829	45
Shale	829	900	71
Hard shale and boulders	900	935	35
Hard shale	935	956	21
Chalk rock	956	978	22
Hard shale	978	1,035	57
Hard shale and boulders	1,035	1,060	25
Gas rock formation	1,060	1,205	145
Gumbo	1,205	1,250	45
Shale	1,250	1,270	20
Gumbo	1,270	1,314	44
Shale	1,314	1,380	66
Gumbo	1,380	1,434	54
Chalk rock formation	1,434	1,795	361
Shale	1,795	1,815	20
Gumbo	1,815	1,875	60
Sand rock formation	1,875	2,060	85
Gumbo	2,060	2,298	238
Lime rock	2,298	2,301	3
Gumbo	2,301	2,306	5
Lime rock	2,306	2,334	28
Gumbo	2,334	2,370	36
Gummy shale	2,370	2,385	15
Lime rock	2,385	2,402	17
Soft shale	2,402	2,424	22
Lime rock (showing oil)	2,424	2,455	31
Broken lime rock	2,455	2,500	45
Broken lime rock	2,500	2,630	130
Hard lime rock	2,630	2,700	70
Broken lime rock	2,700	2,727	27
Hard lime rock	2,727	2,731	4
Broken lime rock	2,731	2,740	9
Hard lime rock	2,740	2,744	4
Broken lime rock	2,744	2,763	19
Hard lime rock	2,763	2,767	4
Broken lime rock	2,767	2,870	103
Hard lime rock	2,870	2,880	10
Broken lime rock	2,880	2,900	20
Hard lime rock	2,900	2,906	6
Broken lime rock	2,906	2,918	12
Hard lime rock	2,918	2,928	10
Broken lime rock	2,928	2,957	29
Hard lime rock	2,957	2,978	21
Hard gas sand	2,978	2,988	10
Gas sands	1,060	1,205	145
Gas sands	2,978	2,988	10

Casing Record: Set 238 feet (11 joints) 10′ in gumbo and cemented; 1230 feet (58 joints) 8′ in gumbo and cemented; 2388′ (106 joints) in lime rock and cemented.

Liner Record: Set 103′ 1″ (5 joints) 4½″ Perforated Liner at 2775′ in broken lime rock with 530′ 8″ (25 joints) 4½″ blank liner, 4½″ collar on top and 4½″ rotary shoe on bottom. Set with J setting tool. Set 79′ 3″ (4 joints) 3″ insorted perforated liner on bottom at 2973′. Hard rock with 215′ 10″ (10 joints) 3″ blank liner on top. Set with J setting tool 4⅜″ diamond point pit. 3″ shank on bottom on liner.

Tested open hole at 2424′ indicated 3 to 5 bbls. oil per day. Set liner and tested at 2455′ with same showing. Pulled liner and drilled 2988′ when well blew out Dec. 24, 1918, blowing some mud and pieces of rock with the gas. After putting on connections and shutting well in December 31, 1918, pumped in mud with high pressure pump for 13 days continuously in effort to kill well and set liner, but without success. Used up all available mud and still had 600 lbs. pressure. Shut well in Jan. 21, 1919, tore down and moved rig.

Correlation.	Depth in Feet.		Thickness.
	From.	To.	
Nacatosh	1,060	1,205	145
Annona	1,434	1,795	361
Lower Cretaceous	2,424±	2,988	564

Log of Edens No. 1. Old Colony Company. Smith Survey, One-fourth of a Mile N. E. of Beckville. Elevation Depot at Beckville 345 ft. Map. Entry 1950.

	Depth in Feet.		Thickness.
	From.	To.	
Surface clay	0	25	25
Gray shale	25	60	35
Lignite and clay	60	79	19
Blue gumbo; set 12½″ at 82′	79	109	30
Water sand	109	121	12
Blue shale	121	203	82
Blue gumbo	203	214	11
Hard sandy lime	214	218	4
Blue shale	218	284	66
Water sand	284	344	60
Blue shale	344	377	33
Water sand	377	396	19
Blue shale	396	428	32
Hard sand	428	438	10
Blue gumbo	438	448	10

Log of Edens No. 1. Oil Colony Company. Smith Survey, One-fourth of a Mile N. E. of Beckville. Elevation Depot at Beckville 345 ft. Map Entry 1950.—Continued.

	Depth in Feet, From.	Depth in Feet, To.	Thickness.
Hard sand	448	455	7
Hard sandy lime	455	457	2
Sand	457	467	10
Blue gumbo and boulders	467	485	18
Blue shale	485	530	45
Sandy lime	530	540	10
Blue gumbo	540	551	11
Sand	551	561	10
Blue gumbo and shale	561	653	92
Blue shale	653	683	30
Blue gumbo	683	694	11
Blue shale	694	714	20
Blue gumbo	714	735	21
Blue shale	735	782	47
Blue gumbo	782	790	8
Blue shale	790	813	23
Blue gumbo	813	818	5
Blue shale	818	838	20
Blue gumbo	838	859	21
Blue shale and gumbo	859	880	21
Blue shale	880	911	31
Blue gumbo	911	929	18
Blue shale	929	948	19
Blue gumbo	948	1,004	56
Shale, blue	1,004	1,049	45
Blue gumbo	1,049	1,054	5
Blue shale	1,054	1,129	75
Blue gumbo	1,129	1,171	42
Blue shale	1,171	1,192	21
Blue gumbo	1,192	1,216	24
Blue shale	1,216	1,251	15
Blue shale and boulders	1,251	1,341	110
Blue gumbo	1,341	1,373	32
Blue shale	1,373	1,393	20
Blue gumbo	1,393	1,430	46
Blue hard shale	1,439	1,490	51
Blue gumbo	1,490	1,510	20
Gray shale	1,510	1,531	21
Blue gumbo	1,531	1,551	20
Gray shale	1,551	1,593	42
Blue gumbo	1,593	1,634	41
Blue shale	1,634	1,725	91
Sandy, lime, shale, pyrite	1,725	1,745	20
Gumbo and chalk	1,745	1,748	3
Sandy lime and shell	1,748	1,788	40
Blue gumbo	1,788	1,798	10
Hard blue shale	1,798	1,859	58
Hard blue gumbo	1,859	1,869	10
Hard blue shale	1,869	1,937	71
Hard blue gumbo	1,937	1,957	20
Hard blue shale	1,957	1,977	20
Hard blue gumbo	1,977	1,988	11
Blue gumbo and chalk	1,988	2,010	22
Lime, shell and chalk	2,010	2,014	4
Chalk and lime	2,014	2,018	4
Chalk	2,018	2,027	9
Lime	2,027	2,044	17
Chalk, lime, pyrite, shell, seams of chert, black lime and black chalk	2,044	2,180	136
Hole reamed to 2,168, seven days, one and one-half hours of reaming and taking cores to date and depth.			
Chalk, lime, pyrite, shell, seams of chert, black lime and chalk	2,180	2,252	72
Hard blue gumbo and lime	2,252	2,260	8
Correction measurement on pipe	2,260	2,296	36
Blue shale	2,296	2,313	17

Log of Edens No. 1. Oil Colony Company. Smith Survey, One-fourth of a Mile N. E. of Beckville. Elevation Depot at Beckville 345 ft. Map Entry 1950.—Continued.

	Depth in Feet, From.	Depth in Feet, To.	Thickness.
Hard blue gumbo	2,313	2,370	57
Hard blue shale and boulders	2,370	2,404	34
Hard blue gumbo	2,404	2,412	8
Black sandy bit; shale	2,412	2,425	13
Blue gumbo and boulders	2,425	2,440	15
Dark sandy shale	2,440	2,458	18
Blue gumbo	2,458	2,485	27
Lime rock	2,485	2,486	1
Black shale and boulders	2,486	2,498	12
Sandy lime	2,498	2,500	2
Blue gumbo	2,500	2,507	7
Dark sandy shale and boulders	2,507	2,528	21
Blue gumbo; depth, noon, January 9, 1922	2,528	2,546	18
Blue gumbo	2,546	2,549	3
Blue sandy shale	2,549	2,598	49
Blue sticky gumbo	2,598	2,616	18
Blue sandy shale	2,616	2,651	37
Chalk and gumbo sample No. 1	2,651	2,658	7
Blue sandy shale	2,658	2,665	7
Blue gumbo	2,665	2,675	10
Blue sandy shale	2,675	2,695	20
Blue sandy marl	2,695	2,721	6
Blue chalk formation, No. 2	2,701	2,715	14
Chalk, lime, and chert	2,715	2,748	33
Sandy shale, No. 3	2,748	2,754	6
Sandy shale, No. 3	2,754	2,764	10
Blue gumbo, No. 3	2,764	2,770	6
Blue sandy shale	2,770	2,806	36
Hard blue shale	2,806	2,818	12
Chalk and lime, No. 4	2,818	2,830	12
Hard chalk lime and shell	2,830	2,885	55
Hard chalky lime and shell	2,885	3,069	184
Hard chalky lime and shell	3,069	3,073	4
Hard white lime	3,073	3,210	137
Hard lime and some chert	3,210	3,220	10
Hard lime, some breaks of shale	3,220	3,258	38
Black shale	3,258	3,287	29
Gray marl	3,287	3,288	1
Correlation.			
Nacatosh (not recognized)			
Annona	2,010	2,296	286
Blossom Sand (not recognized)			
Lower Cretaceous	2,701?	3,210	509

Log of Flanagan No. 1. Panola Petroleum Co., Antwine Duboise Survey N. W. Part of County, Near Sabine River. Twelve Miles N., Two Miles W. of Carthage. Elevation 200 ± Map Entry 1975 ±

	Depth in Feet.		Thickness.
	From.	To.	
Sand	0	25	25
Shale	25	30	5
Sand	30	84	54
Sand	84	110	26
Rock	110	114	4
Shale	114	135	21
Lignite	135	150	15
Rock	150	151	1
Pack sand	151	184	33
Sand	184	213	29
Rock	213	214	1
Hard rock	214	216	2
Sand	216	268	52
Sand	268	290	22
Gumbo; set 10" casing	290	308	18
Gumbo	308	318	10
Hard rock	318	319	1
Shale	319	350	31
Rock	350	354	4
Rock	354	358	4
Rock	358	361	3
Gumbo	361	410	49
Rock	410	411	1
Shale	411	431	20
Gumbo	431	451	20
Shale	451	494	43
Gumbo	494	570	76
Rock	570	572	2
Gumbo	572	597	25
Gumbo	597	632	35
Hard rock	632	635	3
Shale	635	670	35
Gumbo	670	752	82
Hard rock	752	754	2
Gumbo	754	865	111
Shale	865	926	61
Shale and gumbo	926	1,000	74
Shale	1,000	1,080	81
Gumbo	1,080	1,130	100
Shale	1,130	1,245	115
Gumbo	1,245	1,250	5
Gumbo, shale; redrilled hole	1,250	1,285	35
Shale; set 8" casing	1,285	1,295	10
Shale; bailing 4"	1,295	1,370	75
Shale	1,370	1,537	167
Hard shale; gumbo	1,537	1,609	72
Sandy shale	1,609	1,688?	79
Chalk rock (not recorded)			
Shale	?	1,729	?
Shale and gumbo	1,729	1,774	45
Shale	1,774	1,800	26
Hard shale	1,800	1,838	38
Chalk and rock	1,838	1,845	7
Shale; reduced hole	1,845	1,860	15
Rock	1,860	1,890	30
Chalk	1,890	1,925	35
Chalk rock	1,925	2,090	165
Chalk	2,090	2,115	25
Hard rock	2,115	2,116	1
Chalk rock	2,116	2,151	35
Chalk rock and shale	2,151	2,175	24
Shale and boulders	2,175	2,225	50
Shale	2,225	2,270	45
Shale and boulders	2,270	2,320	50
Sand rock	2,320	2,324	4
Sand rock and shale	2,324	2,364	40

Log of Flanagan No. 1. Panola Petroleum Co., Antwine DDuboise Survey N. W. Part of County, Near Sabine River. Twelve Miles N., Two Miles W. of Corthage. Elevation 200± Map Entry 1975—Continued.

	Depth in Feet, From.	To.	Thickness.
Shale	2,364	2,450	86
Gumbo: set 6" casing, bailing 6"	2,450	2,454	4
Soft shale	2,454	2,519	65
Shale	2,519	2,596	77
Sand and shale	2,596	2,682	86
Rock	2,682	2,706	24
Shale	2,706	2,709	3
Shale; shut down for break	2,709	2,710	1
Shale and boulders	2,710	2,720	10
Chalk rock	2,720	2,825	105
Shale and boulders	2,825	2,862	37
Total depth	2,862		
Correlation.			
Nacatosh (not recognized)			
Annona	1,835	2,175	337

Log of Furrh No. 1, Producers Oil Company, Thoman Alston Survey, 5200 ft. N. and 900 ft. E. of S. W. Corner; About One Mile from N. and Five Miles from E. Boundary Line. Elevation 350.8. Map Entry 1442. Well Dry.

	Depth in Feet. From.	To.	Thickness.
Surface clay	0	20	20
Blue sand	20	140	120
Rock	140	142	2
Sand	142	168	26
Sand. boulders	168	263	95
Gumbo	263	320	57
Rock	320	322	2
Shale	322	422	100
Gumbo	422	452	30
Rock	452	453	1
Gumbo	453	463	10
Shale	463	513	50
Rock	513	514	1
Shale	514	559	45
Rock	559	560	1
Shale	560	599	39
Rock	599	601	2
Gumbo	601	616	15
Shale	616	700	84
Shale and gumbo	700	815	115
Shale	815	880	65
Gumbo	880	1,030	50
Shale	1,030	1,050	20
Gumbo	1,050	1,125	75
Gas rock	1,125	1,255	130
Gumbo	1,255	1,293	38
Chalk rock	1,293	1,325	32
Pack sand	1,325	1,366	41
Chalk rock	1,366	1,384	18
Gumbo	1,384	1,393	9
White shale	1,393	1,420	27
Gumbo	1,420	1,435	15

Log of Furrh No. 1, Producers Oil Company, Thomas Alston Survey, 5200 ft. N. and 900 ft. E. of S. W. Corner; About One Mile from N. and Five Miles from E. Boundary Line. Elevation 350.8. Map Entry 1442. Well Dry.—Continued.

	Depth in Feet,		Thickness.
	From.	To.	
Shale	1,435	1,445	10
Gumbo	1,445	1,517	72
Shale	1,517	1,537	20
Chalk rock	1,537	1,792	255
Shale and boulders	1,792	1,812	20
Gumbo	1,812	1,837	25
Shale	1,837	1,874	37
Sand rock	1,874	1,876	2
Gumbo	1,876	1,921	45
Sand rock	1,921	1,927	6
Gumbo	1,927	1,942	15
Shale	1,942	1,957	15
Sand rock	1,957	1,958	1
Sand rock and pack sand	1,958	1,978	20
Gumbo	1,978	2,003	25
Sand rock	2,003	2,023	20
Gumbo	2,023	2,028	5
Sand rock	2,028	2,043	15
Gumbo	2,043	2,071	28
Pack sand	2,071	2,088	17
Gumbo	2,088	2,126	38
Shale	2,126	2,136	10
Gumbo	2,136	2,272	136
Shale	2,272	2,309	37
Chalk rock	2,309	2,333	24
Shale	2,333	2,400	67
Shale and shell rock	2,400	2,458	58
Chalk rock	2,458	2,477	19
Shale	2,477	2,497	20
Rock	2,497	2,499	2
Chalk rock	2,499	2,510	11
Shale and sand	2,510	2,550	40
Shale	2,550	2,570	20
Chalk rock	2,570	2,707	137
Shale	2,707	2,717	10
Gumbo	2,717	2,726	9
Hard shale	2,726	2,733	7
Shale	2,733	2,745	12
Gumbo	2,745	2,750	5
Chalk rock	2,750	2,756	6
Rock and pyrites	2,756	2,766	10
Rock	2,7	2,761	3
Rock and shale	2,769	2,809	40
Shale	2,809	2,817	8
Shale	2,817	2,821	4
Chalk rock	2,821	2,827	6
Gumbo	2,827	2,842	15
Rock	2,842	2,846	4
Shale and boulders	2,846	2,863	17
Gumbo	2,863	2,866	3
Shale and boulders	2,866	2,871	5
Shale and sand	2,871	2,889	18
Shale and boulders	2,889	2,902	13
Gumbo	2,902	2,907	5
Shale and sand	2,907	2,921	14
Shale and boulders	2,921	2,931	10
Gumbo	2,931	2,965	34
Rock	2,965	2,970	5
Sand rock	2,970	2,972	2
Gumbo	2,972	2,993	21
Rock	2,993	2,997	4
Gumbo	2,997	3,034	37
Pack sand	3,034	3,037	3
Packed sand	3,037	3,040	3
Shale and boulders	3,040	3,047	7
Packed sand	3,047	3,053	6
Shale and boulders	3,053	3,061	8

Log of Furrh No. 1, Producers Oil Company, Thomas Alston Survey, 5200 ft. N. and 900 ft. E. of S. W. Corner; About One Mile from N. and Five Miles from E. Boundary Line. Elevation 350.8. Map Entry 1442. Well Dry.—Continued.

	Depth in Feet,		Thickness.
	From.	To.	
Gumbo	3,061	3,068	7
Rock	3,068	3,079	11
Gumbo and gravel	3,079	3,085	6
Gumbo	3,085	3,097	12
Shale and boulders	3,097	3,105	8
Gumbo	3,105	3,131	26
Rock	3,131	3,132	1
Gumbo	3,132	3,163	31
Rock	3,163	3,168	5
Gumbo	3,168	3,170	2
Gumbo and gravel	3,170	3,172	2
Rock	3,172	3,174	2
Shale and boulders	3,174	3,191	17
Rock	3,191	3,192	1
Gumbo	3,192	3,197	5
Shale and boulders, rock	3,197	3,210	13
Shale and boulders	3,210	3,235	25
Rock	3,235	3,258	23
Shale and boulders	3,258	3,297	39
Gumbo	3,297	3,299	2
Gumbo and boulders	3,299	3,309	10
Gumbo	3,309	3,317	8
Rock	3,317	3,321	4
Gumbo	3,321	3,325	4
Rock	3,325	3,327	2
Hard shale	3,327	3,330	3
Shale and boulders	3,330	3,333	3
Casing Record: 276', 12½"; 1,265', 9⅝"; 2,317', 6⅝".			
Gumbo	3,333	3,339	6
Correlation.			
Nacatosh sand	1,125	1,255	130
Annona	1,537?	1,792	255

Log of Guill No. 1. Wm. English Survey, Six Miles from E. and Nine Miles from N. County Line. Elevation by Aneroid 315. Map Entry 1510.

	Depth in Feet.		Thickness.
	From.	To.	
Sand	0	25	25
Lignite	25	27	2
Sand	27	38	11
Lignite	38	40	2
Sand	40	106	66
Gumbo	106	122	16
Lignite	122	127	5
Gumbo	127	136	9
Rock	136	138	2
Gumbo	138	174	36
Rock	174	175	1
Gumbo	175	216	41
Shale and boulders	216	238	22
Gumbo	238	360	22
Shale	360	396	36
Gumbo and boulders	396	484	88
Rock	484	486	2
Shale	486	516	30
Gumbo	516	577	61

Log of Guill No. 1. Wm. English Survey, Six Miles from E. and Nine Miles from N. County Line. Elevation by Aneroid 315. Map Entry 1510.—Continued.

	Depth in Feet.		Thickness.
	From.	To.	
Shale	577	585	8
Gumbo	585	618	33
Shale	618	655	37
Gumbo	655	810	155
Shale and boulders	810	820	10
Gumbo	820	961	141
Shale	961	995	34
Gumbo	995	1,029	34
Gyp	1,029	1,046	17
Gumbo	1,046	1,064	18
Gumbo	1,064	1,109	45
Shale	1,109	1,122	13
Gumbo	1,122	1,147	25
Hard shale and pyrites	1,147	1,157	10
Gumbo	1,157	1,162	5
Shale and shells	1,162	1,180	18
Packed sand	1,180	1,228	48
Chalk, set lines and bailed dry	1,228	1,230	2
Chalk	1,230	1,240	10
Packed sand	1,240	1,255	15
Gumbo	1,255	1,272	17
Hard shale, streaks of sand rock	1,272	1,296	24
Chalk rock	1,296	1,414	118
Chalk with streaks of shale and gumbo	1,414	1,521	107
Chalk	1,521	1,825	301
Gumbo	1,825	1,849	24
Shale and boulders	1,849	1,860	11
Gumbo	1,860	1,872	12
Sandy shale	1,872	1,900	28
Gumbo	1,900	1,954	54
Hard sandy shale	1,954	1,958	4
Gumbo	1,958	1,983	25
Sandy shale	1,983	1,996	13
Packed sand	1,996	1,997	1
Gumbo	1,997	2,009	12
Shale	2,009	2,013	4
Packed sand and pyrites	2,013	2,034	21
Gumbo	2,034	2,051	17
Packed sand	2,051	2,071	20
Gumbo	2,071	2,117	46
Shale	2,117	2,134	17
Gumbo	2,134	2,144	10
Shale	2,144	2,174	30
Gumbo	2,174	2,282	108
Chalk and gyp.	2,282	2,300	18
Gray shale	2,300	2,320	20
Gumbo and shells	2,320	2,362	42
Hard shale and broken lime rock	2,362	2,383	21
Lime rock	2,383	2,389	6
Shale and shells	2,389	2,395	6
Gyp rock	2,395	2,405	10
Hard shale and gyp.	2,405	2,415	10
Gyp and gumbo	2,415	2,433	18
Lime rock, set liner, salt water flow and gas	2,433	2,530	97
Lime rock	2,530	2,707	177

Casing Record: 206′, 10″; 1064′, 6″ set 206′, 10″ csg. Set 6″ casing at 1064′. Bailed dry at 1074′, drilled in to 1230′, set liner and bailed dry, at 1212′. Set liner at 2115′ bailed down about 1800′ and 6″ seat gave way. Set 6″ at 2330′ cemented 30 sks. cement, bailed dry at 2340′, set liner 2380′, salt water flow and gas. Total depth, 2707′.

Heavy flow salt water reported at bottom of well.

Correlation.

Nacatosh	1,180	1,228	48
Annona	1,296	1,825	529

Log of Lawrence No. 1. Transcontinental Oil Co., About Eight Miles S. W. of Carthage and Near Clayton. Elevation by Aneroid 354 Feet. Map Entry 1836.

	Depth in Feet.		Thickness.
	From.	To.	
Surface sand and gumbo	0	58	58
Rock	58	62	4
Gumbo	62	80	18
Sand and boulders	80	100	20
Gumbo and boulders	100	141	41
Sand	141	170	29
Gumbo	170	190	20
Rock	190	191	1
Gumbo	191	318	127
Sand	318	322	4
Rock	322	330	8
Gumbo and boulders	330	335	5
Shale	335	382	47
Hard rock	382	383	1
Gummy shale	383	389	6
Sand	389	420	31
Rock	420	422	2
Packed sand	422	500	78
Rock	500	502	2
Shale and boulders	502	560	58
Gumbo and boulders	560	572	12
Hard rock	572	574	2
Shale	574	589	15
Rock	589	608	49
Gumbo and boulders	608	1,000	392
Gyp	1,000	1,007	7
Gummy shale	1,007	1,017	10
Gumbo and boulders	1,017	1,072	55
Shale	1,072	1,090	18
Gumbo and boulders	1,090	1,258	168
Shale	1,258	1,280	22
Gumbo and boulders	1,280	1,450	170
Gyp rock	1,450	1,500	50
Gyp rock	1,500	1,570	70
Shale	1,570	1,580	10
Gumbo and boulders	1,580	1,665	85
Shale	1,665	1,673	8
Gumbo and boulders	1,673	1,692	19
Gyp rock	1,692	1,698	6
Gumbo	1,698	1,768	70
Shale	1,768	1,795	27
Chalk	1,795	1,853	58
Gummy shale	1,853	2,090	237
Chalk rock	2,090	2,114	24
Chalk rock	2,114	2,190	76
Gummy shale	2,190	2,200	10
Hard chalk	2,200	2,210	10
Gumbo	2,210	2,215	5
Gumbo	2,215	2,224	9
Sand rock	2,224	2,230	6
Gumbo	2,230	2,241	11
Shale	2,241	2,263	22
Sand rock	2,263	2,271	8
Gumbo	2,271	2,307	36
Shale	2,307	2,313	6
Gumbo	2,313	2,333	20
Shale	2,333	2,338	5
Gumbo	2,338	2,346	8
Shale	2,346	2,354	8
Gumbo	2,354	2,370	16
Packed sand	2,370	2,378	8
Gumbo	2,378	2,404	26
Sand rock	2,404	2,407	3
Pack sand	2,407	2,423	16
Shale	2,423	2,430	7
Gyp rock	2,430	2,445	15

Log of Lawrence No. 1. Transcontinental Oil Co., About Eight Miles S. W., of Carthage and Near Clayton. Elevation by Aneroid 354 Feet. Map Entry 1836.—Continued.

	Depth in Feet.		Thickness.
	From.	To.	
Shale	2,445	2,460	15
Gumbo	2,460	2,508	48
Salt water sand	2,508	2,509	1
Lime rock	2,509	2,660	151
Gumbo	2,660	2,745	85
Lime rock	2,745	2,909	164
Shell rock and sand	2,909	3,175	266
Broken formation oil sand and shell rock salt water	3,175	3,203	28
Lime and shell rock	3,203	3,297	94
Correlation.			
Nacatosh sand (not recognized)			
Annona	1,795?	2,190	395
Lower Cretaceous	2,500?	2,745	236

Log of McLain No. 1. Commercial Drilling Co., T. O. Carruth Survey, Five Miles E., One and One-half N. of Carthage. Elevation By Aneroid 197 Feet. Map Entry 1609.

	Depth in Feet.		Thickness.
	From.	To.	
Sand	0	50	50
Lignite	50	57	7
Sand	57	60	3
Lignite	60	65	5
Sand	65	90	25
Rock	90	93	3
Sand and gumbo	93	168	75
Rock	168	172	4
Sand	172	182	10
Gumbo	182	215	33
Shale	215	305	90
Gumbo	305	333	28
Rock	333	335	2
Gumbo	335	347	12
Rock	347	350	3
Gumbo	350	375	25
Shale	375	421	46
Gumbo	421	450	29
Rock	450	451	1
Shale and gumbo	451	680	229
Gumbo	680	1,010	330
Chalk	1,010	1,031	21
Shale	1,031	1,038	7
Gumbo	1,038	1,064	26
Shale	1,064	1,094	30
Gumbo	1,094	1,140	46
Shale	1,140	1,180	40
Gumbo	1,180	1,225	45
Shale	1,225	1,240	15
Chalk	1,240	1,317	77
Gumbo	1,317	1,343	26
Chalk	1,343	1,380	37
Gumbo	1,380	1,415	35
Chalk	1,415	1,479	64
Gumbo	1,479	1,545	66

Log of McLain No. 1. Commercial Drilling Company, T. O. Carruth Survey, Five Miles E., One and One-half N. of Carthage. Elevation By Aneroid 197 Feet. Map Entry 1609.—Continued.

	Depth in Feet.		Thickness.
	From.	To.	
Chalk	1,545	1,740	195
Chalk pyrites	1,740	1,760	20
Chalk	1,760	1,775	15
Chalk pyrites	1,775	1,795	20
Chalk	1,795	1,806	11
Gumbo	1,806	1,860	54
Pack sand	1,860	1,870	10
Shale	1,870	1,891	21
Gumbo	1,891	1,893	2
Shale and boulders	1,893	1,928	35
Gumbo	1,928	1,946	18
Shale and boulders	1,946	2,009	63
Gumbo	2,009	2,026	17
Gumbo, sand rock, streaks	2,026	2,046	20
Hard sand rock	2,046	2,050	4
Shale	2,050	2,112	62
Gumbo	2,112	2,122	10
Shale	2,122	2,140	18
Gumbo	2,140	2,165	25
Shale	2,165	2,200	35
Gumbo	2,200	2,225	25
Hard shale lime streaks	2,225	2,254	29
Set 6" casing	2,254	2,264	10
Lime	2,264	2,300	36
Shale	2,300	2,304	4
Gumbo	2,304	2,338	34
Lime rock, very hard	2,338	2,340	2
Gumbo	2,340	2,377	37
Shale	2,377	2,393	16
Lime rock	2,393	2,491	98
Gumbo	2,491	2,500	9
Lime rock	2,500	2,545	45
Shale	2,545	2,549	4
Lime rock	2,549	2,559	10
Shale	2,559	2,564	5
Gumbo (set 4½" at 2,566')	2,564	2,573	9
Lime rock	2,573	2,793	220
Lime rock, very hard	2,793	2,835	42
No report	2,835	2,892	57
Salt water sand	2,892	2,894	2
Show of light gravity red oil from about 2,395 feet. Flow of salt water from 2,894 feet.			
Correlation.			
Nacatosh (not recognized)			
Annona	1,545	1,805	260

Log of Nail No. 1. National Oil Co., Three Miles Southeast of Clayton, and About Nine Miles Southwest of Carthage. Elevation By Aneroid 268. Map Entry 1832.

	Depth in Feet.		Thickness.
	From.	To.	
Sand	0	10	10
Clay	10	20	10
Gumbo	20	31	11
Sand and rock	31	50	19
Gumbo	50	100	50
Sand and rock	100	212	112
Sand and rock	212	235	23
Rock	235	236	1
Sand	236	240	4
Rock	240	242	2
Sand and rock	242	265	23
Rock	265	267	2
Sand	267	275	8
Rock	275	277	2
Sand and rock	277	300	23
Hard rock	300	302	2
Sand	302	355	53
Gumbo	355	371	16
Rock	371	376	5
Sand (gas showing at 437')	376	464	88
Rock	464	465	1
Sand	465	500	35
Gumbo	500	510	10
Shale and boulders	510	584	74
Rock	584	590	6
Sand	590	595	5
Tough gumbo	595	630	35
Soft shale	630	688	58
Gumbo	688	700	12
Sand	700	715	15
Hard shale	715	750	35
Gumbo	750	790	40
Hard shale	790	814	24
Shale and boulders	814	914	100
Packed sand	914	924	10
Gumbo	924	945	21
Hard rock	945	950	5
Shale	950	960	10
Hard gumbo	960	975	15
Shale and boulders	975	1,010	35
Rock	1,010	1,013	3
Sandy shale	1,013	1,060	47
Gumbo	1,060	1,080	20
Shale and boulders	1,080	1,160	80
Gumbo and boulders	1,160	1,200	40
Gumbo and boulders	1,200	1,225	25
Shale and boulders	1,225	1,260	35
Gumbo	1,260	1,275	15
Shale and boulders	1,275	1,505	230
Shale	1,505	1,594	89
Chalk	1,594	1,638	44
Shale	1,638	1,751	113
Chalk	1,751	1,800	49
Shale	1,800	1,818	18
Hard chalk	1,818	1,847	29
Chalk	1,847	2,100	253
Hard shale	2,100	2,130	30
Sandy shale and boulders	2,130	2,178	48
Sandy shale	2,178	2,235	57
Sand rock	2,235	2,265	30
Shale	2,265	2,280	15
Sandy shale	2,280	2,295	15
Sand rock	2,295	2,304	9
Hard sandy shale	2,304	2,323	19
Sandy shale	2,323	2,365	42

Log of Nail No. 1. National Oil Co., Three Miles Southwest of Clayton, and About Nine Miles Southwest of Carthage. Elevation By Aneroid 268. Map Entry 1832.—Continued.

	Depth in Feet.		Thickness.
	From.	To.	
Shale	2,365	2,404	39
Shale and rock	2,404	2,420	16
Hard shale	2,420	2,448	28
Shale	2,448	2,489	41
Nacatosh (not recognized)			
Annona	1,818	2,100	282

Log of Pierce No. 1. Hog Bayou Oil Co. George Robert Survey. Two Miles N. E. of Carthage. Elevation 261'. Map Entry 1640.

	Depth in Feet.		Thickness.
	From.	To.	
Clay	0	20	20
Sand	20	45	25
Rock	45	47	2
Shale	47	174	127
Lignite	174	177	3
Sand and rock	177	200	23
Gumbo	200	255	55
Rock	255	258	3
Shale and boulders	258	297	39
Shale	297	320	23
Gumbo	320	366	46
Rock	366	368	2
Gumbo	368	415	47
Shale	415	432	17
Rock	432	433	1
Gumbo and boulders	433	437	4
Shale	437	486	49
Gumbo	486	495	9
Shale	495	574	79
Gumbo	574	594	20
Shale	594	684	90
Gumbo	684	705	21
Gas rock; show of gas	705	706	1
Gumbo	706	752	46
Shale	752	829	77
Gumbo	829	851	22
Shale and boulders	851	865	14
Gumbo	865	880	15
Shale and boulders	880	947	67
Gumbo	947	957	10
Shale and boulders	957	1,056	99
Shale and boulders	1,056	1,065	9
Gumbo	1,065	1,071	6
Shale and boulders	1,071	1,112	41
Gumbo	1,112	1,118	6
Shale and boulders	1,118	1,134	16
Gyp and gumbo	1,134	1,140	6
Chalk	1,140	1,154	14
Shale	1,154	1,162	8
Gumbo	1,162	1,275	13
Chalk	1,275	1,301	26
Shale	1,301	1,311	10
Chalk and gyp	1,311	1,326	15
Shale: hard gray	1,326	1,349	23
Shale	1,349	1,399	50

Log of Pierce No. 1. Hog Bayou Oil Co. George Robert Survey. Two Miles N. E. of Carthage. Elevation 261. Map Entry 1640.—Continued.

	Depth in Feet.		Thickness.
	From.	To.	
Chalk	1,399	1,463	64
Shale	1,463	1,550	87
Hard shale	1,550	1,582	32
Chalk or white shale	1,582	1,614	32
Chalk	1,614	1,901	87
Gumbo	1,901	1,904	3
Shale	1,904	1,918	14
Gumbo	1,918	1,926	8
Sandy shale	1,926	1,946	20
Gumbo	1,946	1,953	7
Packed sand	1,953	1,957	4
Shale	1,957	1,960	3
Packed sand	1,960	1,969	9
Shale	1,969	1,973	4
Gumbo	1,973	1,977	4
Packed sand	1,977	1,978	1
Shale	1,978	1,999	21
Packed sand	1,999	2,004	5
Gumbo	2,004	2,046	42
Sand rock	2,046	2,047	1
Gumbo	2,047	2,072	25
Shale	2,072	2,076	4
Packed sand	2,076	2,082	6
Gumbo	2,082	2,095	13
Shale rock	2,095	2,100	5
Sand rock	2,100	2,105	5
Gumbo	2,105	2,108	3
Shale	2,108	2,109	1
Gumbo	2,109	1,112	3
Sand rock	2,112	2,118	6
Sandy shale	2,118	2,128	10
Sand rock	2,128	2,133	5
Shale	2,133	2,145	12
Sand rock	2,145	2,148	3
Gypsum	2,148	2,150	2
Gumbo	2,150	2,167	17
Shale	2,167	2,200	33
Shale and boulders	2,200	2,220	20
Shale	2,220	2,240	20
Gumbo	2,240	2,243	3
Shale	2,243	2,260	17
Gypsum	2,260	2,267	7
Shale and boulders	2,267	2,300	33
Lime rock and shale	2,300	2,390	90
Shale	2,390	2,400	10
Gumbo	2,400	2,419	19
Shale	2,419	2,429	10
Gumbo	2,429	2,448	19
Lime	2,448	2,467	19
Lime rock	2,467	2,635	168
Lime and pyrites	2,635	2,646	11
Gumbo	2,646	2,684	38
Broken lime	2,684	2,692	8
Gumbo	2,692	2,701	9

Log of Corrie G. Steele No. 2. Magnolia Petroleum Company. Ben C. Jordan Company. Elevation 287.8. Map Entry 1392.

	Depth in Feet.		Thickness.
	From.	To.	
Clay	0	22	22
Sand	22	85	63
Sand and gumbo	85	125	40
Rock	125	128	3
Gumbo	128	159	31
Soft gumbo	159	200	41
Gumbo and boulders	200	255	55
Rock	255	260	5
Tough gumbo	260	300	40
Gumbo and rock	300	304	4
Rock	304	305	1
Gumbo	305	320	15
Shale and gumbo	320	372	52
Soft gumbo	372	492	120
Tough gumbo	492	574	82
Shale	574	589	15
Gumbo and streaks of shale	589	630	41
Soft gumbo	630	640	10
Shale and soft gumbo	640	690	50
Shale and shell rock	690	746	56
Shale	746	800	54
Shale and gumbo	800	838	38
Hard shale	838	858	20
Shell rock	858	860	2
Hard shale	860	883	23
Tough gumbo	883	915	32
Hard shale	915	957	42
Hard shale and tough gumbo	957	990	33
Hard shale	990	996	6
Rock	996	997	1
Shale	997	1,008	11
Gas rock	1,008	1,013	5
Gas rock and hard pack sand	1,013	1,063	50
Pack sand	1,063	1,068	5
Rock and streaks of gumbo	1,068	1,087	19
Sandy shale	1,087	1,110	23
Hard sandy shale	1,110	1,150	40
Hard sand	1,150	1,153	3
Tough gumbo	1,153	1,170	17
Gumbo and shale	1,170	1,200	30
Chalk rock	1,200	1,206	6
Hard chalk rock	1,206	1,225	19
Gumbo and chalk rock	1,225	1,282	57
Gummy chalk	1,282	1,378	96
Gumbo and chalk	1,378	1,418	40
Hard chalk rock	1,418	1,617	199
Chalk rock	1,617	1,670	53
Gumbo and streaks of chalk	1,670	1,680	10
Gumbo	1,680	1,734	54
Gumbo and streaks of chalk	1,734	1,769	35
Sand rock	1,769	1,784	5
Gumbo	1,784	1,812	28
Shale	1,812	1,840	28
Sandy shale	1,840	1,850	10
Gummy shale	1,850	1,875	25
Gas sand streaks	1,875	1,890	15
Sand	1,890	1,909	19
Streaks of rock	1,909	1,919	10
Cap rock	1,919	1,920	1
Gas sand	1,920	1,926	6
Casing record: 304', 10"; 1785', 8".			
Correlation.			
Nacatosb	1,008	1,068	60
Annona	1,418	1,680	262
Blossom	1,875	1,926	51
Well reported making 20 M gas initial at 1,926 feet.			

Log of Waterman No. 1. The Texas Company. Thomas A. Pratt Survey. Five Miles N., Three Miles E. of Carthage. Elevation 203.9 Feet. Map Entry 1635.

	Depth in Feet.		Thickness.
	From.	To.	
Clay	0	12	12
Sand	12	43	31
Gravel	43	47	4
Hard sand	47	64	17
Soapstone	64	90	26
Shale	90	110	20
Soapstone	110	120	10
Shale	120	151	31
Hard sand	151	157	6
Hard sandy gumbo	157	162	5
Hard rock	162	164	2
Gumbo	164	172	8
Rock	172	173	1
Gumbo	173	184	11
Hard rock	184	192	8
Hard shale	192	209	17
Hard rock	209	210	1
Gumbo	210	228	18
Rock	228	229	1
Hard shale	229	293	64
Gumbo	293	298	5
Shale	298	300	2
Gumbo	300	303	3
Shale	303	347	44
Rock	347	353	6
Shale	353	360	7
Gumbo	360	374	14
Rock	374	375	1
Shale	375	395	20
Gumbo	395	405	10
Shale	405	430	25
Gumbo	430	444	14
Hard shale	444	548	104
Gumbo	548	573	25
Shale	573	614	41
Rock	614	615	1
Gumbo	615	619	4
Shale	619	665	46
Shale and boulders	665	713	48
Tough gumbo	713	735	22
Shale	735	788	53
Shale and boulders	788	852	64
Shale	852	862	10
Gumbo	862	867	5
Shale	867	887	20
Gumbo	887	894	7
Shale	894	915	21
Gumbo	915	935	20
Shale	935	998	63
Gumbo	998	1,013	15
Chalky shale	1,013	1,063	50
Gumbo	1,063	1,071	8
Chalk rock	1,071	1,078	7
Gumbo, showing a little gas at 1077'	1,078	1,092	14
Soft shale	1,092	1,177	85
Gumbo	1,177	1,184	7
Hard shale with chalk	1,184	1,277	93
Broken chalk	1,277	1,282	5
Chalk rock	1,282	1,302	20
Shale	1,302	1,322	20
Hard chalk rock	1,322	1,355	33
Chalk and shale	1,355	1,429	74
Chalk rock	1,429	1,440	11
Gumbo	1,440	1,484	44
Shale	1,484	1,541	57
Gumbo	1,541	1,547	6
Chalk rock	1,547	1,839	292
Gumbo	1,839	1,849	10

Log of Waterman No. 1. The Texas Company. Thomas A. Pratt Survey. Five Miles N., Three Miles E. of Carthage. Elevation 203.9 Feet. Map Entry 1635.—Continued.

	Depth in Feet.		Thickness.
	From.	To.	
Shale	1,849	1,860	11
Tough gumbo	1,860	1,876	16
Hard shale	1,876	1,920	44
Gyp rock	1,920	1,945	25
Gumbo	1,945	1,955	10
Shale	1,955	1,983	28
Sand rock	1,983	1,987	4
Sand	1,987	1,995	8
Lime rock	1,995	2,000	5
Sand	2,000	2,005	5
Lime rock	2,005	2,014	9
Sand rock, well tried to blow out at 2015	2,014	2,017	3
Shale	2,017	2,027	10
Gumbo, tested at 2,029′, bailed and measured oil by bailer, well good for 6 bbls. per day	2,027	2,032	5
Shale, sand	2,032	2,067	35
Sand	2,067	2,098	31
Sand shale	2,098	2,108	10
Gumbo, bailed well at 2,116′, getting 20 to 30 gals. of oil to the bailer per hr.	2,108	2,140	32
Hard shale	2,140	2,150	10
Hard gumbo	2,150	2,168	18
Hard shale	2,168	2,178	10
Gumbo	2,178	2,186	8
Hard shale	2,186	2,194	8
Hard gumbo	2,194	2,200	6
Hard shale	2,200	2,215	15
Soft shale	2,215	2,223	8
Gumbo	2,223	2,226	3
Hard shale	2,226	2,246	20
White lime	2,246	2,300	54
Shale	2,300	2,400	100
Lime-shell showing of gas from 2,420′ to 2,458′. Little oil, gas and salt water at 2,470′	2,400	2,517	117
Lime and sand	2,517	2,535	18
Hard lime	2,535	2,550	15
Broken lime	2,550	2,595	45
Soft hard lime	2,595	2,620	25
Broken lime	2,620	2,685	65
Hard lime	2,685	2,707	22
Correlation.			
Nacatosh sand, not recognized. Found in some other wells on this property as thin sands at a depth of between 1,210′ and 1250′.			
Annona	1,547	1,839	292
Lower Cretaceous	2,400	2,707	307
Record has been obtained of six additional wells drilled on the Waterman property. In three of these a thin sand varying from 5′ to 12′ in thickness is recorded at a level approximately 600′ above the base of the Annona. These thin sands, doubtless, represent the Nacatosh, which would be expected at about this level.			

Log of Werner B-1. Gulf Production Co. E. E. Corner Samuel Pierce Survey. Three Miles from E. and Ten Miles from N. County Line. Elevation 272 Feet. Map Entry 1508.

	Depth in Feet, From	Depth in Feet, To.	Thickness.
Surface formation	0	190	190
Shale	190	230	40
Gumbo	230	270	40
Gumbo	270	306	36
Shale	306	376	70
Gumbo	376	430	54
Shale	430	437	7
Shale	437	518	81
Gumbo	518	531	13
Shale	531	580	49
Gumbo	580	590	10
Rock	590	607	17
Shale	607	635	28
Gumbo	635	645	10
Shale	645	687	42
Shale	687	728	41
Gumbo	728	749	21
Shale	749	826	77
Rock	826	829	3
Shale	829	1,055	226
Shale	1,055	1,080	25
Gas rock	1,080	1,082	2
Gas rock	1,082	1,095	13
Sand	1,095	1,123	28
Gas rock	1,123	1,145	22
Sandy shale	1,145	1,235	90
Sandy shale	1,235	1,275	40
Chalk rock	1,275	1,320	45
Chalk rock	1,320	1,425	105
Shale	1,425	1,500	75
Chalk rock	1,500	1,555	55
Chalk rock	1,555	1,780	225
Gumbo	1,780	1,795	15
Gumbo	1,795	1,829	34
Sand	1,829	1,833	4
Shale	1,833	1,875	42
Gumbo	1,875	1,897	22
Shale	1,897	2,233	336
Lime rock	2,233	2,237	4
Shale	2,237	2,285	48
Gumbo; set 6" casing	2,285	2,288	3
Gumbo	2,288	2,296	8
Shale	2,296	2,358	62
Broken sandy lime	2,358	2,387	29
Broken sandy lime, with oil showing	2,387	2,395	8
Hard lime	2,395	2,420	25
Hard lime	2,420	2,440	20
Correlation.			
Nacatosh	1,080	1,145	65
Marlbrook	1,145	1,500	355
Annona	1,300	1,780	280
Brownstown & Bingen	1,780	2,358	578
Lower Cretaceous	2,358	2,440	82